Pedogenesis distribution of mineral sands in the Babylon governorate soils, Iraq .

Warda Jawad Ameen **Amal Radhi Jubier Al-Qureshi**

Al-Qasim Green University

Email: amelradha@agre.uoqasim.edu.iq

Abstract

The area of Al-Rarangiyah, located in the province of Babylon, was chosen within the sedimentary plain, with an area of 9540.36 hectares, which is confined between within longitudes 44^{0}12'0" to 44^{0}30'0" east and latitudes 32^{0}12'0" to 32^{0}24'0" north. Prospects are described morphology and sampling The results of the mineral analysis of light sand minerals showed that the percentage of light sand minerals ranged between 90.40 - 97.80%. Quartz is the dominant mineral in light sand minerals, followed by lime and rock pieces.
the decrease in the values of the weathering index is due to the weak weathering of minerals and the high percentage of feldspar, while the increase in the weathering index is due to the decrease The percentage of feldspar and the high percentage of quartz and the possibility of exposure to something of weathering, as it is noted that the weathering index is higher for some horizons soils than it is in the horizons above or below it.

Keywords: light sand minerals, Al-Rarangiyah region, maps, weathering evidence

Introduction

Iraqi soils are sedimentary soils resulting from continuous sedimentation processes, and most of them are soils transported from places exposed to weathering, and sedimentation processes occur by winds, rivers and floods, and sedimentation occurs after induction and erosion processes, meaning that it is the last geological process (1), and sedimentary soils in regions The Iraqi sedimentary plain is newly formed soil formed from stratified sedimentary materials of mixed origin mainly from the Tigris and Euphrates rivers. and its developmentIt is the geological factor more than the pedological factor, as these soils vary and are distributed according to the change in the type and size of the river load transported from its weathering areas, so the river load gains special importance in studies concerned with the type of sedimentation, the sedimentary environment and its mineral composition, in addition to the quantities transported by those rivers.
There are many studies that emphasized the importance of studying the partical size distribution analysis of the soil lobules and studying the mineral composition of these lobules in order to know the nature of weathering to which the soil is exposed and to understand the processes and their sedimentation environments. Soil and its origin materials and determining the extent of the textures of those soil artifacts, in addition to distinguishing soil formation processes and possibly estimating its latent fertility (2).
Due to the importance of light sand minerals, the research was directed to prepare a map of the distribution of light sand minerals and the weathering index in the Al-Rarangiyah region.

MATERIALS AND METHODS

The area of Al-Raranjieh, located in Babylon Governorate, was selected within the sedimentary plain, with an area of 9540.36 hectares, which is confined between longitudes 44^{0}12'0" to 44^{0}30'0" east and latitudes 32^{0}12'0" to 32^{0}24'0" north.(figer 1)
The soil samples were air-dried and their orbits were crumbled manually and with a polyethylene hammer to preserve the morphology of the minerals in them. They were passed through a sieve with a diameter of 2 mm to be ready for laboratory measurements.

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-Removing and separating the minerals from the sand separator

The binders were removed from the soil samples, which included washing the dissolved salts with distilled water more than once according to the method of (3), after that the organic matter and free oxides were removed according to what was stated by (4) and(5), after that The process of separating sand from clay and silt was carried out with a diameter sieve Its apertures are 50 microns, and after drying, the heavy sand minerals were separated from the light ones by means of bromoform liquid with a specific weight of 2.89. ethyl, After that, a weight of 5 grams was taken from the sand part for the purpose of separating the heavy and light minerals according to the method proposed by (6 and 7), after that the light part and the heavy part of the minerals were weighed to find out the ratio of each in the sand separator, then Light and heavy sand minerals are scattered after air drying A glass slide and fixed with gum arabic Canda balsam with a refractive index of 1.54, then the slide is covered with a cover glass for the purpose of diagnosing minerals using a polarized optical microscope of the type Lietz water-made and with a camera of the same type and determining the percentage of each mineral by point countingpoinolcounter and according to the method proposed by (8) and described in (9).

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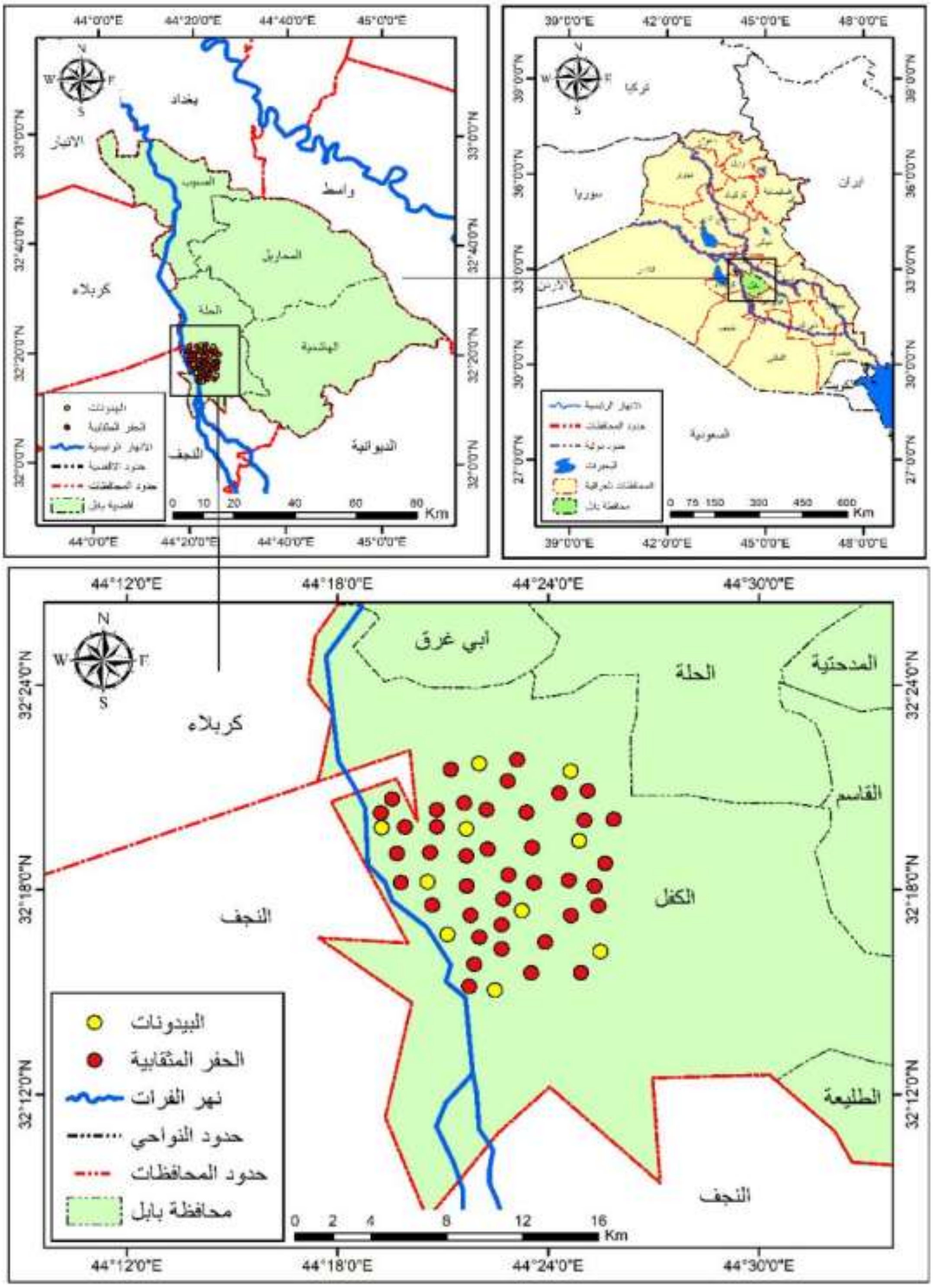

Figer 1 Location of sites sudy

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Results and discussion

Light sand minerals

The results of Table 1 showed the percentage by weight of the light sand minerals, which ranged between 97.80 - 90.40%, and the predominance was for the mineral quartz, followed by lime, then feldspar, then calcite, then rock pieces, and finally chlorite, mica, and gypsum.

The proportions of quartz mineral in the horizons of the soils of the study ranged between 39.66 - 20.28%, as the lowest percentage was in the C1 horizon of pedons 2 and the highest percentage in the C2 horizon of pedons 9. The reason for the increase in the percentage of this mineral in the horizons of pedons is attributed to the physiographic location of these pedons, as noted. The supremacy of this mineral in the soils of the horizons of pedons is due The reason is its dominance in sedimentary soils, due to its resistance to weathering due to the nature of its chemical bonds, its hardness, and its lack of cracks (10), in addition to the effect of sedimentation processes that lead to the transfer or keeping of this mineral stuck in the sediment transport medium, due to its light weight, which leads to its transfer to long distances and after thisThe mineral is the most stable mineral under sedimentary conditions (11, 12)This mineral can be formed by the desilication process that occurs for the mineral feldspar (ornoclase and plecoclase), while the high percentages of single quartz minerals are due to the influence of the nature of the parent material, which is the main component of the sand separator (13).

It comes in the third place in terms of predominance in the soils of the horizons of pedons is the mineral geret, as its percentage ranges between 27.46 - 18.43%, as the lowest percentage was in the horizon C1 of the pedon 3 and the highest percentage in the horizon C3 of the pedon 2, and its high percentage indicates that the deposits of the parent material are rich With silica, it is one of the minerals that resist weathering and that the cause of high Its percentage in river sediments is due to the nature of the mineral composition of the parent material (14)As for feldspar minerals, it comes in the third rank in terms of predominance, as its percentage ranged between 12.31 and 18.93%, as it was the lowest percentage in the C2 horizon of pedon 9 and the highest percentage in the C1 horizon of pedon 7, and its presence can be attributed to its exposure to weathering due to the agricultural exploitation of these soils. Most of the feldspars in the sediments are from the cycle The first sedimentary rock is characterized by a group of cracks characteristic of some types, and it is easy to weather and has little stability and resistance to erosion factors.

Also, the relationship of the group of feldspar minerals with quartz is an important key to knowing the history of sediments.

The mineral calcite comes in the fourth rank in terms of predominance, as its percentage in the horizons of pedons ranged between 15.65 - 9.48%, as the lowest percentage was in the C3 horizon of pedons 7, and the highest percentage in the horizon C1 of pedons 3, and the reason for its high percentage is to a sedimentary source material rich in carbonate minerals (15).

The group of rock-cut minerals comes in the fifth rank in terms of predominance, as its percentage ranged between 4.76 - 1.54%, as it was the lowest percentage in the horizon C1 of pedon 5 and the highest percentage in the horizon C1 of pedon 2. The reason for the increase in its percentage indicates its proximity to a source Sedimentation and it did not travel long distances, as the rock cutting through the processTransportation by river is not easy because the size of most of them decreases to be the size of mud or silt, and their percentage can increase due to the addition of sediment from the branches of the water channels, which compensates for the depletion obtained from the induction process (16), and may be due to mechanical erosion that dominates the chemical weathering conditionsRapid erosion, which can transfer materials or particles quickly by water. Therefore, non-fixed minerals do not have enough time to be exposed to weathering and

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erosion processes, so their percentage remains high in sediments (16).

Then the group of mica minerals with a rate that ranged between 3.95 - 1.49%, as it was the lowest percentage in the Ap horizon of Al pedon 2, while the highest percentage was in the Ap horizon of Al pedon 5. The decrease in its percentage can be attributed to its weak resistance to weathering and it weathers to skatite minerals under the conditions Dry and semi-dry It is a sheet metal, because of its shapeIt can be washed from the coarse sand during the separation process, and tends to accumulate and settle in the size of fine silt (17). As for the gypsum mineral, its percentage ranged between 3.41 - 1.05%, as it was the lowest percentage in the Ap horizon of pedon 6, and the highest percentage in Horizon C3 of Al-pedon 9, as gypsum is present in sedimentary rocks and is distinguishedIt contains a quantity of water and its solubility in hydrochloric acid (18).Finally, the mineral chlorite, as its percentage ranged from 1.36 - 3.98% in the horizons of paidoon soils, as it was the lowest percentage in the C2 horizon of pedon 7 and the highest percentage in the C3 horizon of pedon 1, and the reason for its presence is attributed to the nature of sedimentation in those sites.

The results of Table 2 and Figure 1 showed the spatial distribution of the percentages of light sand minerals, as they were distributed in the Ap horizon in three ranges. The range 95.33 - 97.80% occupied the largest area of 6291.14 hectares with a rate of 65.94%, while the range 90.40 - 92.87% occupied the smallest area in this horizon amounted to 437.37 hectares. With a rate of 4.58%, its distribution is in the C1 horizon Red the range 91.00 - 93.13 %, the smallest area of 772.24, with a rate of 8.09 %, while the range occupied 93.13 - 95.27 %, the largest area of 5189.27, with a rate With a rate of 73.47% and the range 90.60 - 93.00%, occupying the smallest space reached 1213.89 hectares, with a rate of 12.72%. Light minerals were distributed in the C3 horizon in three ranges. The range also occupied 90.60 - 92.87%.

The smallest area amounted to 461.09 hectares, with a rate of 4.83%. As for the range 92.87 - 95.13%, it occupied the largest area, which reached 7125.42 hectares, with a rate of 74.69%.

It appears from the results of the percentages of light sand minerals with a specific weight less than 2.89, that quartz is the dominant mineral in all horizons of pedons, and the reason is attributed to its high resistance to weathering due to its chemical bonds, in addition to its inheritance from the parent material. minerals in someconditions, in addition to the influence of the secondary physiographic location (19) It is noted from the results of Table 1 that the weathering of light sand minerals, which adopted the ratio of **quartz / feldspar** as evidence of the severity of weathering of light minerals (20), because the presence of feldspar is an excellent indicator of the presence of a dry climate in its environment, and this is used to explain the existence of ancient climates (21). As the values of the weathering index ranged between 6.86 – 2.45, as it was the lowest value in the horizon C1 of the pedon 7 and the highest value in the horizon C2 of the pedon 3, and that the decrease in the values of the weathering index is due to the weak weathering of minerals and the high percentage of feldspar, while the increase in the weathering index is due to the decrease The percentage of feldspar and the high percentage of quartz and the possibility of exposure to somethingof weathering, as it is noted that the weathering index is higher for some horizons soils than it is in the horizons above or below it. Sediments that have not been weathered for a long period of time or did not have enough time to weather its minerals (22)

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Table 1 : Percentages of light sand minerals

Weathering index	Percentages of light sand minerals	Rock fragment	Chlorite	Mica	Chert	Gypsum	Calcite	feldespar	Microcline feldespar	Plagioclase felaespar	Orthoclase feldspar	Quartz	Polycrstalli ne quartz	Monocrystal line quartz	Hor.	
3.88	96.8	10.86	2.73	1.84	25.85	3.88	13.53	8.46	3.00	3.07	2.39	32.85	4.23	28.62	Ap	P1
5.82	96.4	8.96	3.3	3.61	22.56	1.96	13.27	6.79	2.23	3.12	1.44	39.55	4.36	35.19	C1	
3.87	92.2	9.05	3.86	3.85	27.78	3.46	9.86	8.65	3.11	4.44	1.1	33.49	3.76	29.73	C2	
4.13	97.2	13.37	3.98	2.46	25.63	3.12	13.4	7.42	2.92	3.13	1.37	30.62	3.51	27.11	C3	
3.3	94.4	10.29	1.97	2.26	26.9	3.8	14.51	9.36	3.87	4.33	1.16	30.91	2.93	27.98	Ap	P2
4.75	95.6	9.76	3.32	2.71	27.31	3.43	14.77	6.73	2.29	3.2	1.24	31.97	3.55	28.42	C1	
3.78	97.8	13.98	2.43	2.69	26.65	3.02	13.82	7.83	2.88	3.78	1.17	29.58	3.42	26.16	C2	
4.25	90.6	9.04	2.63	2.38	25.47	2.92	12.12	8.65	3.01	4.19	1.45	36.79	3.37	33.42	C3	
4.3	97.4	11.8	2.47	2.46	25.05	1.87	15.47	7.71	2.32	3.32	2.07	33.17	3.32	29.85	Ap	P3
3.5	92.6	11.82	1.55	1.54	27.2	1.55	16.65	8.82	2.96	3.12	2.74	30.87	3.13	27.74	C1	
6.86	95.4	10.58	2.43	2.24	24.76	2.67	14.93	5.39	1.22	3.06	1.11	37	3.5	33.5	C2	
4.33	93	10.82	3.19	3.7	22.82	3.04	11.58	8.42	2.71	3.82	1.89	36.43	3.73	32.7	C3	
3.1	96.6	11.96	2.88	3.52	23.54	2.17	11.02	10.96	3.75	4.11	3.1	33.95	3.28	30.67	Ap	P4
2.63	91.4	14.2	1.74	2.18	23.72	2.54	16.69	10.73	3.18	4.53	3.02	28.2	2.05	26.15	C1	

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4.17	**90.6**	**9.94**	**2.95**	**3.13**	**18.8**	**2.71**	**14.53**	**9.28**	**2.92**	**3.97**	**2.39**	**38.66**	**3.6**	**35.06**	**C2**	
4.18	**94**	**14.76**	**1.62**	**2.03**	**25.02**	**3.2**	**15.09**	**7.39**	**2.1**	**3.33**	**1.96**	**30.89**	**3.12**	**27.77**	**C3**	
2.9	**94.8**	**15.04**	**2.96**	**3.95**	**18.99**	**2.82**	**10.84**	**11.65**	**3.84**	**4.11**	**3.7**	**33.75**	**2.95**	**30.8**	**Ap**	**P5**
2.99	**96.4**	**13.57**	**1.73**	**2.32**	**24.9**	**3.07**	**10.76**	**10.94**	**3.72**	**5.2**	**2.02**	**32.71**	**3.08**	**29.63**	**C1**	
2.5	**97.8**	**15.43**	**2.34**	**2.18**	**26.66**	**2.05**	**14.86**	**10.43**	**3.11**	**4.76**	**2.56**	**26.05**	**2.91**	**23.14**	**C2**	
3.87	**92.4**	**15.44**	**2.76**	**2.27**	**25.18**	**2.33**	**14.6**	**7.68**	**2.33**	**3.9**	**1.45**	**29.74**	**4.14**	**25.6**	**C3**	

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Continue to Table 1

Weathering index	Percentages of light sand minerals	Rock fragment	Chlorite	Mica	Chert	Gypsum	Calcite	feldespar	Microcline feldespar	Plagioclase felaespar	Orthoclase feldspar	Quartz	Polycrstalli ne quartz	Monocrystal line quartz	Hor.	
2.85	97.6	14.76	1.75	2.98	25.95	1.05	13.78	10.32	3.49	3.51	3.32	29.41	4.12	25.29	Ap	P6
3.57	97.4	15.55	3.2	2.32	25.08	2.7	13.24	8.29	2.11	3.65	2.53	29.62	4.08	25.54	C1	
4.32	95.8	13.41	2.02	3.29	28.21	2.57	11.43	7.34	2.57	3.03	1.74	31.73	4.61	27.12	C2	
3.01	97.4	13.96	1.97	1.76	26.65	1.97	14.77	9.71	3.72	3.88	2.11	29.21	3.78	25.43	C3	
3.45	93.4	14.06	2.1	1.49	26.98	2.33	12.43	9.13	3.2	3.91	2.02	31.48	4.33	27.15	Ap	P7
2.45	97	15.31	2.87	3.04	26.91	3.77	15.32	9.5	2.87	4.43	2.2	23.28	2.03	21.25	C1	
3.1	92.4	15.29	1.36	2.93	25.83	1.87	14.9	9.22	2.8	4.3	2.12	28.6	2.2	26.4	C2	
3.31	93.8	15.84	2.16	2.52	24.34	2.32	10.48	9.83	3.33	3.41	3.09	32.51	4.4	28.11	C3	
4.41	90.4	15.84	3.02	1.93	23.9	1.95	14.87	7.12	2.08	3.73	1.31	31.37	2.66	28.71	Ap	P8
2.99	97	15.69	3.66	2.28	22.03	2.66	15.54	9.55	3.18	3.22	3.15	28.59	2.51	26.08	C1	
2.63	91.8	14.86	3.57	2.33	26.93	1.81	15.64	9.61	2.31	4.99	2.31	25.25	1.82	23.43	C2	
3.65	93.4	13.69	2.93	2.15	24.15	2.48	15.81	8.35	2.32	4.58	1.45	30.44	4.46	25.98	C3	
5.59	94.8	12.37	3.05	3.61	25.9	2.77	14.29	5.77	1.83	2.76	1.18	32.24	4.05	28.19	Ap	P9
3.07	95.6	12.04	3.12	2.88	22.81	3.09	12.81	10.63	3.2	5.12	2.31	32.62	4.18	28.44	C1	
4.82	93.8	12.97	2.91	2.52	24.98	2.68	15.65	6.58	1.62	3.89	1.07	31.71	3.98	27.73	C2	
3.29	96.4	15.55	2.09	2.73	24.45	3.41	13.77	8.85	3.15	4.4	1.3	29.15	3.77	25.38	C3	
3.66	97.8	15.92	2.22	3.08	25.18	2.17	13.58	8.12	1.26	4.63	2.23	29.73	2.86	26.87	Ap	P10
3.47	91	15.78	2.61	3.85	22.85	2.91	14.38	8.42	2.32	4.99	1.11	29.2	2.03	27.17	C1	
2.98	96.4	12.19	2.76	2.77	26.19	2.1	15.02	9.78	2.11	4.62	3.05	29.19	2.65	26.54	C2	
3.83	97.2	13.87	1.67	3.16	23.03	2.75	15.12	8.37	2.77	3.84	1.76	32.03	3.11	28.92	C3	

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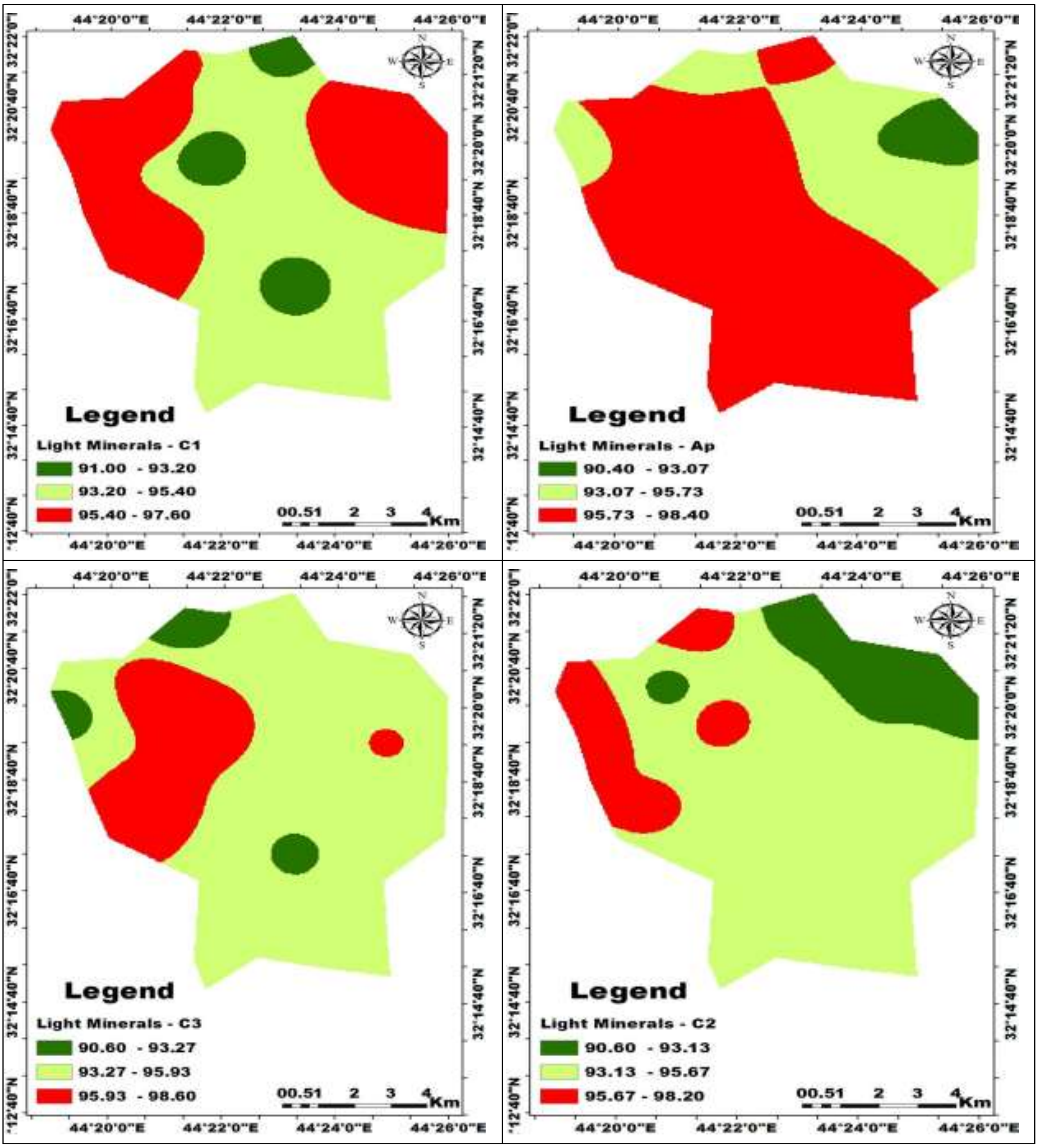
Apperrance 1 spatial distribution for light sand minerals



ISSN 2072-3857

Reference

1- Al-agidi, W.K. (1990). Soils and Land Use Administration , Ministryuses , of Higher Education and Scientific Research University of Baghdad , Iraq .

2-AL-Musawi, Hameed Kazem Abdel-Ameer (1997). Bedological Stratigraphy of Al araqeeb in the Iraqi Sedimentary Plain, Al-Musayyib Al-Kabeer Project. PhD thesis, College of Agriculture - University of Baghdad, Iraq

3- Kvnze, G. W., 1965. Pretreatment for mineralogical analysis. Methods of soil Analysis. Part 1. Physical and Mineralogical Properties, Including Statistics of Measurement and Sampling,pp. 568-577.

4- Anderson , J.U.(1963) . An impoved pretreatment for mineralogical analysis of samples containing organic matter . Clay and clay miner .,10:380-385 .**5- Mehra, O.P. and Jackson, M.L., 1968.** Iron oxide removal from soils and clays by adithionite-citrate system buffered with sodium bicarbonate. In Clay and clay minerals:proceedings of the Seventh National Conference (pp.317-327).

6- Tucker ,M. E., (edits). 1988, Techniques in Sedimentoltgy. Black Well. Oxford 394P.

7- Fleet ,W. F.1926 .Petrology notes on the red sandstone of the west midlands. Geol. Mag. V, 63. P.505-516.

8-Gerrard , J . 1992 . Soil geomorphology an integration of pedology and geomorphology .Chapman &Hall , 269p .

9- Carver ,R.E., 1971. Procedures in sedimentary petrology .John wiley and sons .653P.

10- Jackson ,M. L., 1968 . Weathering of primary and secondary minerals in soil . In International congress of soil science ,International Society of soil science , 4:281-292.

11- AL-Ani ,Amal Muhammad Salih ,2006 . Applications of numerical classification in the classification of sone shoulder chains of rivers in the Iraqi sedimentary plain. PhD thesis ,College of Agriculture,University of Baghdad . Iraq.

12- AL-Fatlawi ,Lama Abdullah Sakban AL-Abadi ,2016 . The effect of sedimentation source on mineral properties and elemental analysis of some soils of Wasit and Maysan governorates. PhD dissertation .College of Agriculture , University of Baghdad , Iraq.

13-ALHafawi , Sami et al.2019. A study of the mineral composition of some soils of As-Suwayda governorate for agricultural research. .275-261 (1)6

14--AL-Obaidi , Bassem Shaker Obaid and Slman Khalaf Issa ,2011 . Mineral composition of fine sand separator in some Iraqi gypsum soils .Tikrit University Journal of Agricultural Sciences. 219-205 :(1)11

15- AL-Muhaimid ,Abd al-Halim Ali , 1984. A study of the inheritance and development of some soils in central Iraqi.Masters thesis , College of Agriculture , University of Baghdad . Iraq .

16- Pettijohn , F.J., P.E. Poter, and R. Siever. 1973 . Sand and sandstones. Springer verlag.N.Y.

17- Ismail , F .I. 1970 . Biotite weathering and clay formation in arid and hummid region . California ,Soil Sci. 109:257-261 .

18- Khalil ,Emad Mohamed Ibrahim, 2014. Mineralogy ,Faculty of Science Library Zagazig University..

19-AL-Hinawy. Et al., 2019. . A study of the mineral composition of some soils of As-Suwayda governorate for agricultural research. .275-261 (1)6

20- Barshad , I .1969 . Chemistry of soil development . PP . 1 – 70 .In E.E. Bear.

21- Folk ,R., 1974 ,Petrology of sedimentary rocks . Hamphill , Texas , 182P

22- AL-Aqili , Nazim Shamkhi Rahal, 2002. Pedalogy and morphology of soil chains in irrigation basins and rivers from the middle of the Iraqi sedimentary plain , PhD thesis ,College of Agriculture .Baghdad University. Iraq.

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